

## NEW TEACHERS AND TECHNOLOGY PREPARATION: IMMERSION OR INFUSION?

By

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### ABSTRACT

*In the 21<sup>st</sup> Century, it is imperative for new teachers to be well prepared for utilizing technology to enhance instruction and increase student learning. While this is true for all teacher education programs it may be more challenging for those steeped in the liberal arts. With an emphasis on thinking liberally and understanding a breadth of knowledge from across the disciplines, adding separate educational technology courses to the already robust program certification requirements is difficult. Some teacher preparation programs have succumbed to this pressure and require all teacher certification candidates to enroll in and pass a course designed for the use of educational technology. This immersion approach ensures all teacher candidates are introduced to the use of technology in education. In a small, liberal arts institution, the author and his colleagues have chosen a different path. Although it requires tremendous coordination and communication, we infuse our curricular content and methods courses with technology so that it is in context and concert with the actual content and pedagogy. This article will examine the current research and explore the advantages and disadvantages of such an approach in preparing undergraduates for teacher certification. The specifics of the context will provide further reasons why this infusion approach appears to be the most effective for preparing teacher candidates to successfully use educational technology.*

*Key words: Teacher Preparation, Learning Technology, Technology Philosophies.*

### INTRODUCTION

#### Background

Valerie, a newly certified second grade teacher, nervously anticipates the first day of school with her new students. She recently graduated from a teacher education program, received her initial teaching certification, and is now eager to put into practice the many theories and ideas gleaned through her education courses and practica. Her classroom is colorful and attractive, designed to welcome and inspire her charges. Based on their records, her 25 young students seem to have a wide range of reading skills and interests. As her eyes peruse the class one more time she notes the three computers on the table over in the corner. She considers how technology might assist her in teaching her students. Perhaps if she had only taken that optional educational technology course last year . . . but her schedule was just too full!

In spite of numerous technology initiatives and grants

over the past five years, this scene is replicated all too frequently. Teacher education programs continue to wrestle with the preparation of technology-proficient educators. How do those responsible for teacher education adequately equip preservice teachers with the knowledge, skills, and attitudes that will enable them to utilize technology to enhance their classroom instruction and increase student learning? This question continues to be explored and debated and diverse approaches have been suggested or implemented, with varying degrees of success. After providing a brief background, this paper will explore a couple of the current dominant approaches and then propose one that appears to be more effective in the context of a small, liberal arts, undergraduate teacher education program.

Technology now permeates our all aspects of our society. In spite of the use of electronic technologies since the 1950s, research studies are limited on the positive

educational impact of using technology (Cradler, 2003). While social critic Neil Postman (1992) bemoaned the surrender of culture to technology long before Web 1.0, Web 2.0 presently provides a platform for unparalleled creativity by the user. Social networking, through outlets such as Facebook, Instant Messaging, texting, and Twittering, keeps people connected during and after school. Streaming movies, television shows and music videos are readily available and can be viewed on a variety of hardware devices. Schools can purchase stand-alone educational software or subscriptions to on-line resources such as encyclopedias, educational videos, and scientific data. Computers are integrated with projectors and Smartboards in many current classrooms. In terms of this rapidly changing technology, what is expected of teacher educators who enter a historically conservative profession? Where does one start to address this evolving technopoly? A brief look at developments over the past decade may be helpful.

After articulating technology standards for students, early in the 21<sup>st</sup> Century the International Society for Technology in Education (ISTE) commissioned its Accreditation and Professional Standards Committee to provide clear expectations for teachers. The National Educational Technology Standards (NETS) project resulted in a set of standards for teachers (ISTE, 2002). Around the same time, the education departments of individual states adopted their own set of technology standards for teachers, often based on the NETS Project. For instance, the State of Illinois crafted nine distinct content-area technology standards, ranging from basic computer operations to collaborative planning, while encompassing productivity, applications, information access, and problem solving (ISBE, 2001). These standards attempt to address both the use of hardware and the process by which technology can be effectively integrated.

The stated purpose for the national standards is to "facilitate school improvement in the United States," (ISTE, 2002, p. 1). Reform includes addressing many inequities and achievement gaps found among students throughout the United States. One of these that emerged

in recent years is known as the "digital divide" (Santos, Santos Jr., & Milliron, 2003). Access to technologies continues to be limited for many minority and low-income students, particularly outside the classroom (Corporation for Public Broadcasting, 2003). Another current issue includes using technology to increase all student achievement so that the rising benchmarks of the 2001 No Child Left Behind Act can be met. With lofty expectations driving the push for technology-proficient educators, how do teacher education programs go about the business of preparing their candidates?

### **Dominant Approaches for Schools of Education**

When preparing candidates to meet technology standards, one of two different approaches tend to be favored by teacher education programs: immersion or infusion. In short, an immersion approach is one in which teacher candidates are immersed in educational technology, typically through one or more focused courses devoted to this topic. These educational technology courses can be found in many teacher education institutions and may be taught by practitioners from the classroom or by computer science faculty. They are likely called Technology for Teachers or Educational Technology. Larger institutions often have their own educational technology professors within their departments or schools of education. The emphasis tends to be on saturating the student with educational technology through the core content of these stand-alone courses.

An infusion approach, on the other hand, is marked by the technology being dispersed throughout the content of many, if not all, education courses. One or two technology instructors are not responsible for the bulk of the technology instruction and integration, but rather many instructors seek relevant ways to incorporate technology in context with their curricular content. In this case, responsibility is shared among the teacher educators. Multiple variations and blends of these two approaches exist, dependent on local conditions and variables. This approach requires a high degree of technological knowledge, collaboration, planning, and coordination among the instructors of these courses.

## Current Research of Effective Integration

How do these approaches vary in the success they have in preparing teacher candidates to meet 21<sup>st</sup> Century technology expectations? Current research points toward some approaches that appear to be more effective. In viewing the literature, three primary themes emerge: the role of one's beliefs (or attitudes) which influence the effective use of technology; the importance of collegial interactions; and the place context plays in the successful integration of technology.

Numerous studies point to the role beliefs or attitudes or expectations play as predictors of one's use of technology (Ravitz, et al., 1999; Russell, et al., 2003; and Lambert, et al., 2008). The prevailing perspectives of teacher candidates and practicing teachers must be addressed when decisions are made concerning educational technologies. Dexter and Reidel's work suggest that this can be partially addressed by setting clear expectations for student teachers in their use of educational technologies (2003). They also note these expectations may vary by context and relationships, two points addressed more fully below. A study by Lambert (2008) indicates that a stand-alone education technology course (immersion approach) resulted in stronger computer ability (skills) but did not impact general computer attitudes. Her conclusion lends credence the thesis that context as collegial interactions may be critical factors often missing in these isolated courses of the immersion approach.

Although the term "collegial interactions" was absent from the literature, it is used to encompass the relational piece that appears to be highly correlated with the successful integration of educational technology by educators. Researchers and practitioners use other words that all seem to involve one or more people connecting with others for the purpose of learning more about the appropriate use of educational technology. For instance, modeling is an synonym that educational technologist David Jonassen chooses. Although he uses this term to describe systems, his constructivist approach is steeped with the scaffolding provided by one more skilled in educational technology (Jonassen, 2006).

Furthermore, support and feedback from cooperating teachers were identified as significant variables in the use of educational technology by student teachers (Dexter & Riedel, 2003). This can be very effective if the cooperating teacher is skilled in using the available technologies. This, however, is not always the case. Many certified, experienced teachers are less familiar and comfortable with new educational technologies, as observed by Liu (2001) in a study on field experiences for prospective teachers. At the time of this particular study, only 20% of the classroom teachers felt prepared to utilize technology effectively in the teaching and learning process. Partly to address this inherent weakness, digital exhibitions have been created so that both veteran and novice teachers can display possible uses of technology in educational settings (Hatch, et al, 2009). Additionally, many on-line teacher networks have been up on the net and effective in helping to meet the need for collaborative interaction. Networking is also a key theme of Jamie McKenzie's workshops and writings for assisting teachers in learning new technologies (1999). Based on both these findings and the arguments of experienced practitioners, it appears that connecting with others who are actively struggling and engaged in the process of utilizing technology more effectively in the classroom, can result in stronger support, enhanced technical skills and more positive attitudes towards the technologies.

Beyond teacher beliefs and positive collegial interactions, one other theme emerges from the literature, namely the importance of the context. That is to say, exposure to an educational technology seems more effective when it exists naturally in the curriculum and is seen as a relevant application of the technology. While already referring to the limitations of the impact of one educational technology course on teacher candidates (Lambert, et al, 2008), numerous other studies tout the effectiveness of housing the educational technologies within the methods or educational curriculum courses. Beisser (1999) proffers the infusion of technology into teacher education courses, using an elementary social studies methods course in her study. She argues for meaningful experiences and the appropriate

application of technologies in lessons and student activities. The National Society for Social Studies (NCSS) makes this process easier with the publication of a book specifically for this purpose (Bennett & Berson, 2007). The editors offer numerous lesson plans, organized by grade level, that incorporate technology in meaningful and effective ways. The long-term impact of technology infused into a social studies methods course also yielded positive results (Franklin & Molebash, 2007). Previously, Bird and Rosaen also argued for authentic contexts as more effective settings for teacher candidates to learn to use technology for instruction and learning (2005). This infusion approach addresses the already crowded teacher preparation curriculum and is more likely to offer relevant connections for education students. Others advocate on behalf of a college-wide infusion of technology preparation in content-area specific courses (Dexter, Doering, & Riedel, 2006). Their experience led to the proposal of a model for this purpose. This context would include the student teaching internship, although the efficacy and technology skill level of cooperating teachers vary widely (Liu, 2001).

There is at least one weakness noted regarding the infusion approach. When the technology is integrated across the curriculum and infused in a teacher education program, its success is dependent on the actual implementation by each of the instructors of education courses. When committing to the infusion approach, there is evidence that many faculty or instructors do not include technology integration, as evidenced by the course syllabi (Klecker, Lennex & Lackner, 2003). Teacher education programs with large numbers of students and instructors might be more susceptible to this inconsistent accountability. Tremendous planning, coordination, and communication would be required to follow through with all instructors, content areas, and the range of technological knowledge and skills among the faculty. Despite this challenge, the institution of the author has adopted a modified infusion approach for preparing our teacher candidates for the technologies of the 21<sup>st</sup> Century.

### Implementation of a Modified Infusion Approach

This institution is a small, private, religiously-oriented, liberal arts, four-year undergraduate college with a teacher education program leading to initial state certification. The strong emphasis on liberal arts requires many hours of general education to aid in the process of our students to be liberated from exclusively narrow, technical training and to become deeper thinkers, theoretically better able to meet the changing challenges of the new century. Perhaps due in part to this emphasis, the department of education is proportionally smaller than what is found in many other similar-sized institutions of higher education, consisting of seven tenure-track professors. With a full curriculum of general education, including a second language requirement, philosophy, and theology, little space is left for additional stand-alone courses on educational technology. While they exist as elective courses in the curriculum, few education students are able to enroll in them.

However, the Department of Education is fortunate to have a fairly stable cadre of instructors as faculty; therefore relationships tend to be deeper, sustained, and more meaningful. In terms of educational technology, it has been possible to discuss, experiment with, collaborate and support each other while infusing technology throughout key methods courses. This culture allows space for faculty to grow professionally in the knowledge and appropriate use of new educational technologies. Some examples from several elementary content/methods courses taught by three to four different instructors should help to illustrate this.

The reading professor is not known as an early adopter of technology. Yet with support and the encouragement of her colleagues, she ascertained that to compile information on pertinent children's books, her individual students could personally create and organize a database. While this practical application was initially new to the instructor and the majority of her students, it is now a standard component of that required methods course.

The content area of math and its methods more easily

lend itself to the use of other software options. As the teacher candidates collect real data, they tabulate it in spreadsheets, creating and interpreting graphs based on the data. Due to a prerequisite that will be described below, they are all familiar with basic spreadsheet functions prior to enrolling in this course. Consequently it is logical to tabulate and use various spreadsheet functions in analyzing the data. These skills are extended in a major assessment project conducted during student teaching.

The language arts methods class is a perfect venue for desktop publishing a newsletter by each enrolled student. It may be used to introduce the student teacher to the students in the elementary classroom. These teacher candidates also have the opportunity to publish their own stories as a children's book, using one of the many technologies available for this purpose. On-line class discussions are also conducted weekly, based on thoughtful language arts questions.

Digital video is a standard component of the social studies methods class. Each student is recorded while teaching a lesson before peers and sees the benefits of visually capturing one's own teaching skill as it progresses. This opportunity is extended through the student teaching practicum and allows the student teacher to self assess and note the growth in teaching skills.

Throughout the all methods courses, students' library and Internet search skills are honed through appropriate assignments. Individual and group curriculum projects are presented utilizing many different technologies. Major content units are created collaboratively on-line, with each pre-service teacher accessing the evolving unit electronically and contributing his or her part. The units include original webquests, and may incorporate other technologies such as video streaming, primary source documents, and audio files. Smartboards, podcasts, shared on-line bookmarks, and digital videos are now in the mix. Questions about legal and ethical dimensions of technology are ongoing and discussed when and where appropriate. Students seek to understand technology, whether low-tech or the latest sophisticated hardware, as a supporting tool for good instruction and learning rather than as a panacea for all

educational issues. These are just some examples of the components of content and methods courses and of their natural and seamless integration with educational technology.

This infusion approach, however, is modified somewhat. An annual survey of pre-service teachers' knowledge and skills of technology reveal a wide range of experiences, skills, and attitudes among students at this institution. While trying to prepare students for the infusion of educational technology in the methods courses, incorrect assumptions were made of their existing technological skills and understanding. Therefore after faculty discussion and debate, a prerequisite was added to the teacher education program, consisting of on-line tutorials that include twenty-four assessments of basic computer skills and learning. This is linked it to the educational foundations course and students have access to a one-year subscription to complete it independently. This ensures a baseline of technological understanding prior to the infusion of educational technology in the methods and content classes.

## Conclusion

While this infusion approach has been effective for this institution for meeting the technology standards for certification, it continues to be contingent on good leadership and a collaborative culture within the education department. In larger, more diverse higher education institutions, this collaboration may be a more difficult to achieve. As educational technologies continue to evolve, conversations must continue in order for our instructors and teacher candidates to be able to adapt, plan, and create using media now in its infancy.

In addition, access to these emerging technologies is vital. Energy and resources are limited and today's technical expertise can quickly devolve into tomorrow's 8-track tape or beta max player. Consequently, colleges and universities must be committed to providing the resources, time and support to maintain a strong educational technology component for education departments. Coupled with a committed faculty, these resources may allow smaller teacher education



programs to better prepare tomorrow's teachers while using today's technologies.

## References

- [1]. Beisser, S. R. (1999). Infusing technology in elementary social studies methods. In SITE 99: *Society for Information Technology & Teacher Education International Conference (10<sup>th</sup>, San Antonio, TX, February 28-March 4, 1999)*. (ERIC Document Reproduction Service No. ED 432 294)
- [2]. Bennett, L., & Berson, M. J. (Eds.). (2007). *Technology-based K-12 lesson plans for social studies*. Silver Spring, MD: National Council for the Social Studies.
- [3]. Bird, T., & Rosaen, C. L. (2005). Providing authentic contexts for learning information technology in teacher preparation. *Journal of Technology and Teacher Education*, 13(2), 211-231.
- [4]. Corporation for Public Broadcasting. (2003). *Connected to the future: A report on children's Internet use from the Corporation for Public Broadcasting*.
- [5]. Cradler, J. (2003). Technology's impact on teaching and learning. *Learning and Leading with Technology*, 30(7), 54-57.
- [6]. Dexter, S., Doering, A. H., & Riedel, E. (2006). Content area specific technology integration: A model for educating teachers. *Journal of technology and teacher education*, 14(2), 325-345.
- [7]. Dexter, S. & Riedel, E. (2003). Why improving preservice teacher educational technology preparation must go beyond the college's walls. *Journal of Teacher Education*, 54(4), 334-346.
- [8]. Franklin, C. A., & Molebash, P. E. (2007). Technology in the elementary social studies classroom: Teacher preparation does matter. *Theory and Research in Social Education*, 35(2), 153-173.
- [9]. Hatch, T., Sun, C., Grossman, P., Neira, P., & Change, T. (2009). Learning from the practice of veteran and novice teachers: A digital exhibition. *Journal of Teacher Education*, 60(1), 68-69.
- [10]. ISBE, (2001). *Content-area standards for educators: Making Illinois schools second to none*. Springfield, IL: Illinois State Board of Education.
- [11]. ISTE, (2002). *National educational technology standards for teachers: Preparing teachers to use technology*. Eugene, OR: International Society for Technology in Education.
- [12]. Jonassen, D. H. (2006). *Modeling with technology: Mindtools for conceptual change*. Upper Saddle River, NJ: Pearson.
- [13]. Klecker, B. M., Lennex, L., & Lackner, K. (2003). Evaluating the integration of technology in a teacher preparation program. Paper presented at the *Annual Meeting of the Mid-Western Educational Research Association* (Columbus, OH, October, 2003). (ERIC Document Reproduction Service No. ED 481 667)
- [14]. Lambert, J., Gong, Y., & Cuper, P. (2008). Technology, transfer and teaching: The impact of a single technology course on preservice teachers' computer attitudes and ability. *Journal of Technology and Teacher Education*, 16(4), 385-410.
- [15]. Liu, J. M. (2001). Integrating educational technology into field experiences and teacher education curriculum - A systemic approach. In *Annual Proceedings of Selected Research and Development [and] Practice Papers Presented at the National Convention of the Association for Educational Communications and technology (24<sup>th</sup>, Atlanta, GA, November 8-12, 2001)*. (ERIC Document Reproduction Service No. ED 470 192)
- [16]. McKenzie, J. (1999). *How teachers learn technology best*. Bellingham, WA: FNO Press.
- [17]. Postman, N. (1992). *Technopoly: The surrender of culture to technology*. New York: Vintage.
- [18]. Ravitz, J., Wong, Y., & Becker, H. (1999). *Report to participants*. Irvine, CA: Center for Research on Information Technology and Organizations. Retrieved August 19, 2009, from: [http://crito.uci.edu/papers/TLC/findings/special\\_report/index.htm](http://crito.uci.edu/papers/TLC/findings/special_report/index.htm).
- [19]. Russell, M., Bebell, D., O'Dwyer, L., & O'Connor, K. (2003). Examining teacher technology use: Implications for preservice and inservice teacher preparation. *Journal of Teacher Education*, 54(4), 297-310.

- [20]. Santos, G. E., Santos Jr., A. G., & Milliron, M. D. Phoenix, AZ: League for Innovation in the Community  
(2003). *From digital divide to digital democracy*. College.
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